

High Performance Bipropellant Space Engines, Phase I

Completed Technology Project (2007 - 2007)



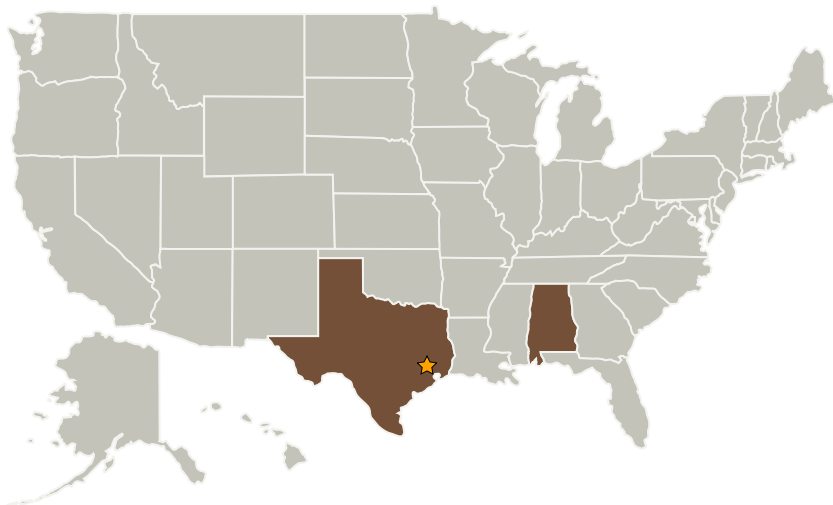
Project Introduction

Advanced bipropellant engines are needed for ARES/ORION vehicle maneuvering and future deep space science missions. Currently, an iridium-lined rhenium combustion chamber is the state-of-the-art for in-space propulsion applications. An example of an in-space engine that incorporates an iridium-lined rhenium thruster is Aerojet's HiPAT apogee engine. This engine uses monomethyl-hydrazine (MMH, $\text{CH}_3\text{N}_2\text{H}_3$) as fuel and nitrogen tetroxide (N_2O_4 , specifically MON-3) as oxidizer. To increase performance of bipropellant engines, improved chamber materials are needed that will allow higher operating conditions (pressure and temperature) and better resistance to oxidation. Therefore, Plasma Processes, Inc. and its partner, Aerojet, propose to develop hafnium oxide-iridium lined rhenium combustion chambers that will simplify engine design and allow higher operating conditions. As a result, a lower cost, higher performance bipropellant space engine will be produced.

Anticipated Benefits

Potential NASA Commercial Applications: Additional applications include, aerospace, defense, commercial propulsion and nuclear industries, high temperature furnaces, corrosion resistant containment cartridges, crucibles for glass/advanced ceramic processing, heat pipes, thermal protection systems, and joining of advanced ceramics to metals.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Plasma Processes, LLC	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	Huntsville, Alabama

Primary U.S. Work Locations

Alabama

Texas

Project Transitions

**January 2007:** Project Start**July 2007:** Closed out

Closeout Summary: High Performance Bipropellant Space Engines, Phase I Project Image

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John Scott S O'dell

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic